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ABSTRACT

As part of the development of the phonics-based reading component of the SWRL Model 2 Communication Skills Program for kindergarten through third grade, this set of 166 spelling-to-sound correspondence rules for one- and two-syllable words was created. Designed to accompany a lexicon for beginning reading instruction, this booklet includes an introduction to spelling-to-sound correspondence rules, a key to pronunciation, and comments on correspondences for primary vowels, secondary vowels, double consonants and palatalization, and individual consonant correspondences. Phonetic spellings, phonemic contexts, examples, and annotations are given for each rule. A bibliography and suggestions for further development are included. (AL)

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Annotated Spelling-to-Sound Correspondence Rules

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ANNOTATED SPELLING-TO-SOUND CORRESPONDENCE RULES

Bruce Cronnell

ABSTRACT

Spelling-to-sound correspondence rules that underlie the phonics-based reading component of the SWRL Model 2 Communication Skills Program are described. Included are the selection of rules, the notational system, rule numbering, and pronunciation. Correspondences holding across all primary (single) vowel rules and on individual secondary vowel (vowel digraph) rules, double consonants and palatalization, and individual consonant correspondences are treated.

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ANNOTATED SPELLING-TO-SOUND CORRESPONDENCE RULES

Bruce Cronnell

The Southwest Regional Laboratory for Educational Research and Development (SWRL) is developing a phonics-based reading program for kindergarten through grade three. In order to read words not previously introduced in reading instruction, children must have an understanding of the spelling-to-sound correspondences of English and must know how to apply these correspondences appropriately. In the design of a reading program which would provide for this knowledge, two objectives were set:

1. to select a lexicon appropriate for children at the kindergarten through third-grade level, and to establish the spelling-to-sound correspondences for this lexicon;

2. to organize these correspondences and the lexicon for use in beginning reading.

To fulfill the first objective, 9000 words were selected which were believed to be in the passive, if not active, vocabulary of children in kindergarten through third grade. The major source of these words was Rinsland (1945), supplemented by additional published word lists and by words from children's books (including reading series), songs and television programs. A set of 166 spelling-to-sound correspondence rules was established for the one- and two-syllable words in this lexicon. These correspondence rules were applied to the lexicon words which were computer processed to arrange words and to provide frequency information about the rules.[1]

The second objective involves sequencing the correspondence rules and the lexicon for beginning reading instruction. Desberg and Cronnell (1969) sequenced the rules by grapheme-unit class, i.e., by primary (single) vowels, by secondary vowels (vowel digraphs), and by consonants. Work is currently under way to combine these classes forming a complete sequence of rules and to arrange the lexicon according to this rule sequence.

In Berdiansky, Cronnell, and Koehler (1969) and in Desberg and Cronnell (1969), the spelling-to-sound correspondence rules were presented briefly with little comment, except for introductory material. The present paper gives more detailed information on the correspondence rules. In addition to elaborating on the rules, changes have been suggested which

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[1]For a complete description of this project, see Berdiansky, Cronnell, and Koehler (1969).

may be needed for a larger lexicon and corrections and changes have been made where necessary. The information in this paper has been derived from a variety of sources, but primarily from the work of the SWRL Rules of Correspondence activity and from the work of Venezky and Weir (Venezky, 1965; Venezky & Weir, 1966; Weir, 1964; Weir & Venezky, 1965). However, except where it seemed important, no effort has been made to document all of the data in this paper, to avoid overloading it with references.

This report contains four sections: Introduction to spelling-to-sound correspondence rules (based on Berdiansky et al., 1969, pp. 12-16), including the Key to Pronunciation (pp. 10-11, in this paper); comments on correspondences for primary vowels; comments on correspondences for secondary vowels; and comments on correspondences for consonants.

SECTION I

INTRODUCTION TO SPELLING-TO-SOUND CORRESPONDENCE RULES

SELECTION OF SPELLING-TO-SOUND CORRESPONDENCE RULES

The spelling-to-sound correspondence rules are based on the work of Venezky and Weir (Venezky, 1965; Venezky & Weir, 1966; Weir, 1964; Weir & Venezky, 1965), with additional information from Wijk (1966). Venezky described the spelling-to-sound correspondences for a 20,000-word vocabulary; because the rules presented here were applied to the one- and two-syllable words of a smaller lexicon, not all of his rules were used. This and earlier reports have not considered polysyllabic words, which will be studied in the future.

Venezky claims that a direct correspondence between spelling and sound cannot always be made; thus he incorporates a morphophonemic level between the graphemic and phonemic representations. For example, -sion would go through the morphophonemic level, //syən//, and then to the pronunciation [šən].[2] (See below, pp. 33-35, for further comments.) While useful and perhaps necessary for descriptive purposes, this level is generally too complex for use in teaching and has not been employed in this study, which instead proceeds directly from spelling to sound. Venezky himself admits this:

> An adequate description of spelling-to-sound correspondences is not something that could or should be...directly applied to the teaching of reading, but rather, in a complete analysis of all that the orthography holds, something that advances our understanding of spelling-to-sound relationships. (Venezky, 1965, p. 52).

However, two of Venezky's related contributions to a description of these relationships have been incorporated into the present work: The use of stress (sometimes called "accent") and morphological information. Knowledge of stress is necessary for the pronunciation of unstressed vowels; therefore, stress has been indicated for all rule-processed words. For example, the stressed a in acorn is pronounced [e] (Rule A13), while the unstressed a in about is pronounced [ə], the usual pronunciation of unstressed vowels. Moreover, one spelling is sometimes pronounced in two ways for two different form classes, depending on stress. For example, conflict (verb) is stressed on the second syllable, giving the first vowel the unstressed pronunciation [ə]; but conflict (noun) is stressed on the first syllable, giving the first vowel the pronunciation [a] (Rule O16).

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[2]See Key to Pronunciation (pp. 10-11) for explanation of phonetic symbols used in this report.

Morphological considerations are often crucial to the interpretation of derived forms, and this has been taken into consideration by indicating boundaries between base forms and endings when this knowledge is necessary for correct rule interpretation. For example, the second b in bomber is silent according to Rule B20--as in bomb--if a morpheme boundary is recognized within the word; in bombard there is no boundary after the second b, so it is pronounced. Correspondences at the word or morpheme level are very important in English (Vachek, 1959); this is especially true in the interpretation of certain inflectional suffixes (see comments on Rules D10 and S10).

The present rules apply to the following kinds of grapheme units: (1) single letters (e.g., a, x); (2) consonant digraphs (e.g., ch, th) and secondary vowels[3] (e.g., ea, oy)--the pronunciation of these grapheme units cannot be determined by analysis of the individual letters; (3) strings of letters which commonly function together as units (e.g., ck, qu); (4) double consonants (e.g., bb, ff).

In general, the criterion for defining a rule was its productivity: A rule was included when it had at least 10 exemplars. Rules which did not meet this criterion (e.g., Rules I12, 032) were included when they were part of general rules concerning all primary vowels. Moreover, when a particular grapheme unit was uncommon in the lexicon (e.g., oe), a rule was generally included to ensure at least one rule for each grapheme unit. In addition, a few unproductive rules (e.g., Rule E25) were included when the words to which they applied occurred frequently in the language. (Desberg & Cronnell, 1969, discuss the interaction of word usage frequency and rule occurrence frequency, listing frequent words which exemplify a number of specific rules.)

Another criterion for rule selection was that the number of exceptions should be kept to a minimum. After initial processing of the words, an examination was made of exceptions, some of which were eliminated by adding rules, giving a total of 166 rules, covering more than 27,000 grapheme units, less than 3% of which are exceptions. While the number of rules may seem large, many of them are generalizable across letters (e.g., Primary Vowel Rules 11-17), even though they have been stated individually for clarity and convenience.

Some rules that had little applicability to elementary reading instruction were not included in this study, e.g., rules for palatalizations, described in pp. 33-35 below. It is believed that expansion of the present lexicon, while adding additional rules and eliminating some exceptions, will not necessitiate the removal of any

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[3]Secondary vowels are vowel digraphs; primary vowels are the single letter vowels, a, e, i, o, u, y.

of the present rules, although a few may require some modification. Possible additions and modifications are discussed in Sections II-IV.

DESCRIPTION OF THE NOTATIONAL SYSTEM

The spelling-to-sound correspondence rules are given in a concise notational system, with prose explanations where needed. Examples of words employing each rule are given.

An arrow (→) means "is pronounced as." To the left of the arrow is the grapheme unit; to the right of the arrow is the pronunciation, enclosed within brackets ([ ]) and indicated by phonetic symbols (explained in the Key to Pronunciation, pp. 10-11). For example, m → [m] is read, "The letter m is pronounced as the sound [m]."

When a particular pronunciation is dependent on a particular environment, this environment is given after a slash (/) following the pronunciation. In the description of the rules, the following symbols are used:

1. __ : the position of the grapheme unit covered by the rule;
2. C : any consonant (including consonantal w and y);
3. V : any vowel (including vocalic y);
4. $\bar{V}$: the "long" pronunciation[4] of a vowel (i.e., [e, ɪ, ay, o, yu]);
5. $\breve{V}$: the "short" pronunciation of a vowel (i.e., [æ, ɛ, ɪ, ɑ, ə];
6. Ø : a silent grapheme unit; not pronounced (e.g., e → Ø in home);
7. ( ) : optional (may or may not be present);

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[4]"Long" and "short" are traditional reading terms but are not valid phonetically. There is no length relationship between "long" and "short" vowels; e.g., [e] ("long a") is not a lengthened [æ] ("short a"). Moreover, in terms of time, length is not dependent on vowel quality, rather on the phonological environment; e.g., the "short" vowel in bid is longer than the "long" vowel in beat (Abercrombie, 1967, p. 81). Venezky's terms "checked" and "free" (for "short" and "long" respectively) might be more appropriate, but the traditional terms are retained here. The phonological relationship between "long" and "short" vowels is complex and probably not known to young children (see Chomsky & Halle, 1968; Berko, 1965).

8. { } : any of the letters or symbols within these braces may occur in this position;

9. - : syllable division (e.g., be-yond, cre-ate), indicated when necessary for rule clarification; for example, in stew-ard, the ew is a single grapheme unit, while in be-ware, e and w are separate grapheme units;

10. # : word/morpheme boundary (the beginning or end of a word/morpheme, e.g., #book#); this may occur within compounds and derivations (e.g., in golden there is a boundary after gold);[5]

11. ... : some letter(s) must appear here;

12. ' : stress; marked on vowels. (Unstressed vowels have been indicated by subscript: $V_{unstressed}$.)

For example, a → [a] /__ $\{^{rC}_{r\#}\}$ is read, "The letter a is pronounced as the sound [a] when it is followed either by the letter r and a consonant or by the letter r at the end of a word."

CORRESPONDENCE RULE NUMBERING

Rules numbered 10 to 19 are major--most productive and general--spelling-to-sound correspondences.[6] A rule 10 (used with consonants and secondary vowels, e.g., Rules J10, EE10) indicates that the grapheme unit has few other rules and few exceptions. When a grapheme unit had one major rule, but numerous other rules and/or exceptions, it was numbered 11 (e.g., Rule EA11); when a grapheme unit had two major rules, both common and productive, they were numbered 11 and 12 (e.g., Rules C11 and 12; OW11 and 12). For primary vowels, with more rules, additional numbers are used. Rules numbered 20 to 29 are minor--less productive and general--spelling-to-sound correspondences.

If, after major and minor rules were accounted for, there was a large number of exceptions for a grapheme unit, they were grouped into rules by their pronunciation; these major classes of exceptions are numbered 30 to 39 (e.g., Rules G31; OU31, 33, 34, 35; general primary vowel exception Rules 32 and 38). All other exceptions are marked as

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[5]In coding the present lexicon, medial morpheme boundaries were marked in the same way as syllable divisions.

[6]Because of rule revisions during the coding process, the rule numbers are not entirely consistent for all grapheme units. Rule numbering will be revised and standardized when the lexicon is expanded.

Rule 40. No Rule 40 is included in the following rule descriptions, because each Rule 40 involves more than one correspondence.

When the same kind of rule applies to more than one grapheme unit, it is given the same number (e.g., rules for silent letters are generally numbered 20).

PRONUNCIATION

Webster's Seventh New Collegiate Dictionary (1965) was used as the source of pronunciation for the study reported in Berdiansky et al (1969). Most of the information on pronunciation used in this report has been found in Kenyon & Knott (1953), which describes "the pronunciation of cultivated colloquial English in the United States" (p. xv). This source will be used more extensively in future work.

The "long-u" sound is either [u] or [yu], as in moo and few. When following [r] or [l], it is always [u]; when following [t, d, s, z, š, ž, č, ǰ, n] it is generally [u], although there is some dialect variation. When following other consonants and vowels, it is generally [yu]; when word initial it is always [yu]. In the following rules all such variation is expressed by writing the pronunciation as [(y)u], except in Rule 0011, where [u] is the only pronunciation.

[ə] (schwa) has been used for unstressed vowels, such as the a in sofa. The "short-u" sound as in cup is also indicated with [ə]. When stressed, the vowel is somewhat different phonetically and may be indicated [ʌ] (e.g., cup [kʌp]). However in this report, [ə] has been used for both stressed and unstressed vowels e.g., cup [kəp], sofa [sófə], above [əbə́v].

The unstressed vowel sound varies considerably from word to word, speaker to speaker and dialect to dialect, and has two major phonetic forms: [ə] and [ɪ] (Francis, 1958, pp. 100, 103-104). However, in this report only [ə] is used to represent all varieties of the unstressed vowel (Francis, 1958, p. 141). It is assumed that speakers will use their own sounds in the appropriate words (Hubbell, 1950).

The "er" sound is phonetically one sound and is sometimes represented by [ɹ] or [ə˞]. In this study, [ər] is used as the representation for stressed and unstressed forms of this sound. (See Kenyon & Knott, 1953, pp. xix-xx, for more details.)

The vowels [ay], [a], and [ə] occur before r as well as other consonants; e.g., pyre, par, purr, respectively. However, in most dialects the following vowels do not contrast before r: [i] and [ɪ] (e.g., pier); [e] and [ɛ] (e.g., pair); [o] and [ɔ] (e.g., pore); [u] and [ʊ] (e.g., poor). As a result, it has been difficult to write some correspondence rules and to code some words. These problems are discussed in more detail at appropriate places below.

In some dialects, [ɑ] and [ɔ] have merged into one sound (Kurath, 1964, p. 90). Thus such words as cot (Rule O15) and caught (Rule AU10) may not contrast. This affects the following rules in particular: for [ɑ]--A21, A23, O15, O16 and O38; for [ɔ]--AU10, AW10 and OU34. Even in dialects where [ɑ] and [ɔ] contrast, the occurrence of these sounds "is highly erratic, varying not only regionally, but also from word to word" (Kurath, 1964, p. 112). This affects the following rules in particular: A24, O21 and O24.

In addition, there are dialect and personal variations in the pronounciation of a few other specific rules. These common variations in rule pronunciation are indicated by giving more than one pronunciation in the rule (e.g., Rule WH10). Further description of dialect variation is given in this paper at the appropriate places. Where such variation is possible, a particular speaker will generally use one pronunciation for all examples to which the rule applies.

Some individual words have idiosyncratic variations in pronunciation, e.g., either [iðər] or [áyðər]; route [rut] or [rawt]. Such words in the present lexicon have been coded P to indicate an alternate pronunciation.

At present there seem to be no simple ways to describe dialect variation in spelling-to-sound correspondences. What can be done is to make program developers and teachers aware of these differences. (One argument for traditional orthography over such "phonemic" systems as i.t.a. is that traditional orthography can more easily handle dialect differences. See Chomsky & Halle, 1968; Fasold, 1969; Key, 1969; Shuy, 1969.)

Key to Pronunciation

The following phonetic symbols are used to indicate pronunciation. The symbols used in *Webster's New World Dictionary* (1957) are given on the right for reference.

Symbol	Key words (corresponding graphemes underlined)		Dictionary Symbol
Vowels			
[i]	scene, neat, see, chief		ē
[ɪ]	bit, hidden		i
[e]	name, day, they		ā
[ɛ]	get, head		e
[æ]	fat, bad		a
[a]	hot, car		o
[ɔ]	song, loss, taught, lawn, talk, ball, thought		ô
[o]	bone, go, fork, toe, board, know		ō
[ʊ]	put, push, book, could		oo
[u]	food, dew, tune		o͞o
[ə]	but, above	(unstressed) (stressed)	ə u
[ay]	cry, mine, die		ī
[aw]	found, owl		ou
[oy]	boy, noise		oi

Symbol	Key words (corresponding graphemes underlined)	Dictionary Symbol
Consonants		
[b]	boy, cab	b
[č]	church, chip, hatch	ch
[d]	dead, do	d
[f]	fun, fair, off	f
[g]	go, gay, egg	g
[h]	home, head	h
[ǰ]	judge, gem, age	j
[k]	kill, kick, come, cat	k
[l]	let, little	l
[m]	man, ham	m
[n]	no, hand	n
[ŋ]	sing, single, think	ŋ
[p]	pull, trip	p
[r]	red, far	r
[s]	see, ice, miss	s
[š]	she, sure, issue, nation, hash	sh
[t]	ten, hit, liked	t
[v]	vase, love	v
[w]	wet, language, quick	w
[y]	yet, you	y
[z]	zoo, lazy, please, wives	z
[ž]	vision, treasure	zh
[θ]	thing, bath	th
[ð]	them, bathe	*th*

SECTION II

SPELLING-TO-SOUND CORRESPONDENCES FOR PRIMARY VOWELS

GENERAL PRIMARY VOWEL RULES

Ten of the primary vowel rules (Rules 11-17, 26, 32, 38) are generalizable across all primary vowels, except y. General primary vowel Rules 11-14 and 15-16 are generalizable to y; however, because of low productivity, they have been collapsed into Y11 and Y15 respectively. When the lexicon is expanded, these rules will be subdivided as they are now for the other primary vowels. General primary vowel rules are described in the next four subsections, with specific correspondences and exemplars given. Following that, the correspondence rules are listed separately for each primary vowel.

"Long-vowel" Rules

The generalized form of the "long-vowel" rule is:

$$V \rightarrow [\overline{V}] \; /__ C(\{^{r}_{l}\}) \; V;$$

that is, a primary vowel is pronounced as its "long" sound when it is following by a consonant (and an optional r or l) and a vowel. In order to show the major ways in which this general rule applies, it has been divided into four parts, general primary vowel Rules 11 to 14. There are at least two major ways in which the "long-vowel" rules may be generalized: (1) each rule, 11 through 14, may be generalized across all primary vowels; (2) Rules 11 through 14 may be collapsed for each primary vowel into the general pattern given above.

General primary vowel Rule 11. $V \rightarrow [\overline{V}] \; /__ Ce\#$

a → [e]	e → [i]	i → [ay]
name	scene	fine
brave	stampede	like
o → [o]	u → [(y)u]	y → [ay]
home	use	rhyme
smoke	crude	type

This is the usual "VCe" rule, generally applicable to one-syllable words, with the final silent e (Rule E18).

General primary vowel Rule 11 applies also when the consonant is a "functionally simple" digraph (Venezky, 1965, p. 39), such as ch, ph, sh and th. Thus the first vowel in such words as ache, bathe and clothe can be covered under general primary vowel Rule 11.

General primary vowel Rule 12. $V \rightarrow [\bar{V}] / __C\{^{r}_{l}\}e\#$

a → [e]	i → [ay]	o → [o]	u → [(y)u]	y → [ay]
acre	title	ogre	bugle	cycle
stable	idle	noble		

This rule apparently has no exemplars with e.

General primary vowel Rule 12 is an extension of Rule 11, with r or l between the consonant and the final e. The environment Cre# occurs only when the consonant is either g or c (see Rule R10).

General primary vowel Rule 13. $V \rightarrow [\bar{V}] / __CV$

a → [e]	e → [i]	i → [ay]
baby	cedar	pilot
native	meter	cider

o → [o]	u → [(y)u]	y → [ay]
notice	unit	tyrant
odor	crusade	stylish

This rule applies when any vowel follows the consonant, including e when not in final position.

As with general primary vowel Rule 11, Rule 13 applies when the consonant is a "functionally simple" digraph. Thus the first vowel in such words as gopher, ether, kosher, and fuchia can be covered by Rule 13.

This rule has many exceptions, the environments for most of which are unknown.

General primary vowel Rule 14. $V \rightarrow [\bar{V}] / __C\{^{r}_{l}\}V$

a → [e]	e → [i]	i → [ay]
April	zebra	migrate
fragrant	declare	idly

o → [o]	u → [(y)u]	y → [ay]
okra	bugler	cyclone
only		hydrant

This is an extension of general primary vowel Rule 13, similar to Rule 12.

"Short-vowel" Rules

The generalized form of the "short-vowel" rule is:

$$V \rightarrow [\breve{V}] / __\{^{CC}_{C\#}\};$$

that is, a primary vowel is pronounced as its short sound when it is followed either by two (or more) consonants or by one consonant at the end of a word. This general rule has been divided into general primary vowel Rules 15 and 16. There are at least two major ways in which the "short-vowel" rules may be generalized: (1) each rule, 15 and 16, may be generalized across all primary vowels; (2) Rules 15 and 16 may be collapsed for each primary vowel into the general pattern given above.

General primary vowel Rule 15. V → [V̆] /__C(C)#

a → [æ]	e → [ɛ]	i → [ɪ]	o → [ɑ]	u → [ə]	y → [ɪ]
sat	set	sit	hot	gum	gym
fast	felt	milk	lock	fuss	myth

This rule applies when the vowel is followed by one or two consonants at the end of a word.

General primary vowel Rule 15 should be expanded to include the environment /__C(C)(C)#, e.g., match, branch. It might also be expanded to /__CCe#, e.g., dance, giraffe, edge; the final e in such words is generally a graphotactic marker (see Rule E18). At present these environments are covered by general primary vowel Rule 16, which generally applies to the first syllable in disyllabic words.

General primary vowel Rule 16. V → [V̆] /__CC...

a → [æ]	e → [ɛ]	i → [ɪ]
saddle	edge	hidden
jacket	extra	little

o → [ɑ]	u → [ə]	y → [ɪ]
motto	sudden	pygmy
hockey	justice	system

This rule applies when the vowel is followed by at least two consonants in the middle of a word; but see general primary vowel Rule 15.

The letter x is a "functionally compound" grapheme (Venezky, 1965, p. 40); that is, it functions as a digraph (CC). This is due to its pronunciation, which is always two sounds, [ks] or [gz]. Thus x can be considered part of the environment in this rule, e.g., axe, Texas. (Cf. general primary vowel Rule 38.)

Primary Vowels in Unstressed Syllables

General primary vowel Rule 17. V → [ə] in unstressed syllables

a → [ə]	e → [ə]	i → [ə]	o → [ə]	u → [ə]
above	hidden	missile	cotton	lettuce
final	talent	office	sailor	minute

(See p. 8 for comments on the pronunciation of unstressed vowels.)

Stress is coded for all one- and two-syllable words in the present lexicon so that the unstressed-syllable rule can be applied. General primary vowel Rule 17 has not been used in classifying words with primary vowels for these two cases: when [ə] is not the pronunciation of the unstressed vowel; for u when a schwa pronunciation can be obtained by using Rules 15 or 16 (e.g., supply).

Unstressed er (E21), ur (U15 or U16), ar, or and ir (A17, O17 and I17) are all pronounced the same: [ər] (see p. 8).

When an unstressed vowel occurs in the environment /...C__{n l}#, it is often not pronounced, making the final consonant syllabic (see Shuy, 1969). This is especially common when the preceding consonant is d or t, e.g., sudden [sədn̩] , little [lɪtl̩]. ([n̩] and [l̩] indicate syllabic [n] and [l].)

[It should also be noted that vowels in some words--particularly function words--are often unstressed in connected speech; see Kenyon (1964, pp. 104-112), Pival & Faust (1965).]

Other General Primary Vowel Rules

General primary vowel Rule 26. V → [V̄] /__-V

a → [e]	e → [i]	i → [ay]	o → [o]	u → [(y)u]
cha-os	cre-ate	li-ar	po-et	flu-id
	me-ow	di-et	po-em	ru-in

When a vowel occurs at the end of a syllable before another vowel ("-" is a syllable division), the first vowel has its "long" pronunciation. (Syllable division indicates that the two vowels are separate and not a part of a secondary vowel pair.)

General primary vowel Rule 32. V → Ø

a → Ø	e → Ø	i → Ø	o → Ø	u → Ø
separate	several	aspirin	sophomore	natural
diamond	difference		licorice	

There are a number of words in English which basically have three syllables; however, the middle vowel (which is unstressed) is generally not pronounced, and the result is a word with two syllables. Such words have been processed as two-syllable words using general primary vowel Rule 32, but they all have an alternate pronunciation--with the vowel (pronounced [ə])--and so have been marked P (see p. 9).

General primary vowel Rule 38. V → [V̆] /__ { vV / x(1)V }

a → [æ]	e → [ɛ]	i → [ɪ]	o → [ɑ]	u → [ə]
cavern	clever	civic	novel	buxom
axis	exit	river	oxen	
axle				

Because of restrictions on the use of English letters, x can never be doubled and v can rarely be doubled (only in four words found by Venezky (1965), none of which are in the present lexicon and all of which are slang: divvy, flivver, navvy, savvy). Because v is not generally doubled, the VvV pattern applies to both the short and long pronunciations of the first vowel. The grapheme unit x always functions as a consonant cluster (a functionally compound consonant; see general primary vowel Rule 16) and thus a primary vowel preceding it always has its short pronunciation. General primary vowel Rule 38 concerns the short pronunciation of primary vowels before xV and vV.

SPECIFIC PRIMARY VOWEL RULES[7]

A

A11	a → [e] /__Ce#	name, brave

In words of two syllables or more ending in ate#, this rule applies only to verbs, e.g., dictate; for adjectives and nouns, A17 applies, e.g., private (cf. the distinction between separate as a verb and as an adjective).

(See Rule A22.)

A12	a → [e] /__C{r, l}e#	acre, stable
A13	a → [e] /__CV	baby, nature

(See Rule A22.)

A14	a → [e] /__C{r, l}V	April, fragrant
A15	a → [æ] /__C(C)#	sat, fast

In certain dialects, some words may use [ɑ], e.g., Eastern and British glass, dance.

A16	a → [æ] /__CC...	saddle, jacket

(See Rule A15.)

A17	a → [ə] in unstressed syllables	above, final

A special form of this rule is a → [ə] /...C__#, e.g., zebra, soda.

A21	a → [ɑ] /__{rC, r#}	cart, car

(See Rule A22.)

A22	a → [ɛ], [æ] /__r	vary, marry

Rule A22 has been used when A11, A13 and A21 do not apply. In most dialects, there is no contrast between [ɛ] and [e] before [r] (see p. 8). Thus Rules A11, A13 and AI10 have been used even when the precise sound may actually be [ɛ] (e.g., mare, Mary, fairy). In some dialects, however, these words may be pronounced instead with [æ].

---

[7]Further comments are not made on Rules 11-17, 26, 32 and 38, discussed above, except where applicable only to a particular grapheme.

A22 (continued)

In other dialects, A11 and one-syllable words with AI10 may contrast with A13 and two-syllable words with AI10, such that mare and fair are pronounced with [ɛ], while Mary and fairy are pronounced with [e].

In most dialects, ar in A11, A13 and A22 are the same, e.g., mare, Mary, marry; in others, there may be a distinction: [ɛ], [e] and [æ] respectively. In all dialects, medial -er- (e.g., merry) is pronounced [ɛr] (Rule E16). However, certain dialects contrast Mary [e], merry [ɛ] and marry [æ]. (In Berdiansky et al, 1969, use of Rule A13 and A22 was somewhat inconsistent. In future Rule A22 will probably be revised to include only the environment /__rr, e.g., marry; while Rule A13 will be used in the environment /__rV, e.g., vary.)

A23 $a \rightarrow [ɔ] / __ \begin{Bmatrix} ll\# \\ lk \\ lt \\ ld \end{Bmatrix}$ ball, walk, salt, bald

The environment has been changed to indicate that the ll must be final; this rule does not apply to medial ll, e.g., valley, where Rule A16 applies. It should also be noted that in compounds all becomes al- (→ [ɔl]); e.g., always. In the environment /a__k, the l is not pronounced, e.g., walk (cf. Rule L20).

A24 $a \rightarrow [a] / \{^{w}_{u}\} __$ wad, squat

This rule applies only when the following consonant sound is not a velar (i.e., is not [k, g, ŋ]); thus it does not apply before k, ng, x, c pronounced [k], or g pronounced [g]. This rule does not apply before r; rather Rule A25 does.

A25 $a \rightarrow [o] / \{^{w}_{qu}_{wh}\} __ r$ war, quart, wharf

This rule is an exception to Rule A21 for a before r. It applies when the sound before a is [w] (since w → [w], Rule W10; qu → [kw], Rule QU10; wh → [hw], [w], Rule WH10).

A26 a → [e] /__-V cha-os

No examples of this rule were found in the present lexicon.

There is no parallel Rule 25 for stressed a in final position (Cf. Rules A17, E25, 025). In one-syllable words, the rule is

a → [a] /#(C)C__#, e.g., fa, ma.

A29 a → [e] /__{nge / ste#} — strange, paste

This is a limited extension of Rule A11.

A32 a → Ø — separate

A38 a → [æ] /__{vV / x(1)V} — cavern, axis, axle

E

E11 e → [i] /__Ce# — scene, stampede

E13 e → [i] /__CV — cedar, meter

Unstressed E13 may be pronounced [ə], e.g., believe.

E14 e → [i] /__C{r / l}V — zebra, declare

E15 e → [ɛ] /__C(C)# — set, felt

In some dialects there is no contrast in pronunciation between e and i in the environment /__n, e.g., pen and pin are pronounced the same.

E16 e → [ɛ] /__CC... — edge, extra

(See Rules E15, A21.)

E17 e → [ə] in unstressed syllables — hidden, talent, magnet

E18 e → Ø /__# — name, edge, immense, mice

Final e is silent, except when part of a secondary vowel or when the only vowel in a word (see Rule E25). Final silent e performs a number of functions (see Jespersen, 1965, p. 193). Its primary use is as a marker of the long vowel pronunciation in general primary vowel Rule 11. It also marks the pronunciation of c, g and th (see Rules C11, G11 and TH12). A final e after s in some words differentiates between a base form (e.g., dense) and an inflected form (e.g., dens). v and u generally do not occur finally, but are followed by an e; e.g., have, continue (see general primary vowel Rule 38, and Rules U20, U26, QU10).

E18 (continued)

> "To limit the two letter words in English to a select group of common words, a final e has been added after a vowel in what would otherwise have been a two letter word. Thus, see, doe, toe, rye, etc. On the addition of e after o, Webster's 1852 *Dictionary* had the following explanation:
>
> > 'Woe.--This word takes the final e, like doe, foe, hoe, sloe, toe, and all similar nouns of one syllable. The termination of o belongs among monosyllables, to the other parts of speech, as potato, tomato, etc.'" (Venezky, 1965, pp. 66-67).

(Cf. comments on double consonants, p. 33.)

Sometimes final e may have two functions, as in nice where it marks both the i → [ay] (Rule I11) and the c → [s] (Rule C11) correspondences.

In a few words, final e is pronounced, e.g., cafe.

E19 $e \rightarrow \emptyset \; /__ \{^{s}_{d}\}$ — arm**e**d, wiv**e**s

This rule applies when ed or es is a past tense or plural form (and not pronounced [əd] or [əz]), whether or not there is a simple verb or singular form (cf. Rule S31). Rule E19 has been used for coding purposes; in teaching, this should be considered a regular automatic phonological alternation (see Rule D10 and S10). Cf. Venezky (1965, pp. 47-48); Vachek (1959).

E21 $e \rightarrow [ə] \; /__ \{^{rC}_{r\#}\}$ — h**e**rd, fath**e**r

This includes unstressed er, e.g., father.

E25 $e \rightarrow [i] \; /\#(C)C__\#$ — w**e**, sh**e**

This rule applies only to one-syllable words.

E26 $e \rightarrow [i] \; /__\text{-}V$ — cr**e**-ate, m**e**-ow

Note the similarity to E25 where the letter is word final.

E32 $e \rightarrow \emptyset$ — diff**e**rence, sev**e**ral

E38 $e \rightarrow [\varepsilon] \; /__ \{^{vV}_{x(1)V}\}$ — cl**e**ver, **e**xit

I

I11	i → [ay] /__Ce#	f<u>i</u>ne, l<u>i</u>ke

In words of more than one syllable with unstressed <u>ine#</u>, there is unpredictable alternation between I11 (e.g., <u>Alpine</u>) and I17 (e.g., <u>famine</u>).

In a number of words, i → [i] /__Ce#, e.g., <u>machine</u>, <u>police</u>; these are generally French borrowings of fairly recent origin.

I12	i → [ay] /__C$\{^{r}_{l}\}$e#	t<u>i</u>tle, <u>i</u>dle
I13	i → [ay] /__CV	p<u>i</u>lot, c<u>i</u>der
I14	i → [ay] /__C$\{^{r}_{l}\}$V	m<u>i</u>grate, <u>i</u>dly
I15	i → [ɪ] /__C(C)#	s<u>i</u>t, m<u>i</u>lk

(See Rule E15.)

I16	i → [ɪ] /__CC...	h<u>i</u>dden, l<u>i</u>ttle

(See Rule E15.)

I17	i → [ə] in unstressed syllables	miss<u>i</u>le, off<u>i</u>ce
I21	i → [ə] /__$\{^{rC}_{r\#}\}$	b<u>i</u>rd, s<u>i</u>r
I22	i → [ay] /__ $\left\{\begin{matrix}nd\\ld\\gn\end{matrix}\right\}$#	f<u>i</u>nd, w<u>i</u>ld, s<u>i</u>gn
I24	i → [ay] /__gh	h<u>i</u>gh, r<u>i</u>ght

This <u>gh</u> is always silent (see Rule GH10) and the rule could be stated thus: <u>igh</u> → [ay].

I25	i → [y] /C__VC in unstressed syllables	mill<u>i</u>on, on<u>i</u>on

In this rule, <u>i</u> functions as a consonant. The most common environment for I25 is /$\{^{n}_{l}\}$__VC#. (Cf. pp. 33-35.)

I26 i → [ay] /__-V li-ar, di-et

Similar to E25 and O25 is the following rule:

i → [i] /C__#; e.g., taxi, ti (in music), ski

The only exceptions appear to be I and hi.

I32 i → Ø aspirin

I38 i → [ɪ] /__$\{^{vV}_{x(1)V}\}$ civic, river

O

O11 o → [o] /__Ce# home, smoke

O12 o → [o] /__C$\{^{r}_{l}\}$e# ogre, noble

O13 o → [o] /__CV notice, odor

O14 o → [o] /__C$\{^{r}_{l}\}$V okra, only

O15 o → [a] /__C(C)# lot, lock

O16 o → [a] /__CC... motto, hockey

O17 o → [ə] in unstressed syllables cotton, sailor

O21 o → [o], [ɔ], [a] /__r horn, tortoise

There is considerable variation in the pronunciation of or, but most individual speakers will use only one form for all pronunciations. However, in some dialects, -oar- and -our- (pronounced [o]) may differ from -or- (pronounced [ɔ]). Thus, for some speakers, hoarse contrasts with horse, and mourning contrasts with morning.

O22 o → [ə] /w__rC word, worth

There is only one exception to this rule: worn (derived from wore, which is regular by Rule O21).

O23 o → [o] /__lC# roll, gold, yolk, bolt

In the environment /o__k, the l is not pronounced, e.g., yolk (cf. Rule L20).

Rule O23 also applies in the environment /__l# in stressed syllables, e.g., control, patrol.

024 o → [ɔ], [a] /__ $\left\{\begin{matrix} fC \\ ng \\ ss \\ st \\ th \\ g\# \end{matrix}\right\}$ o<u>ff</u>, s<u>o</u>ften, s<u>o</u>ng, m<u>o</u>ss, l<u>o</u>st, m<u>o</u>th, d<u>o</u>g

The environment /__st will be deleted from future versions of this rule, since there are nearly as many exceptions (pronounced [o]) as exemplars (compare <u>lost</u> and <u>most</u>).

The environment /__g# should probably also be deleted since there is so much individual variation in pronunciations (see p. 9).

025 o → [o] /__# g<u>o</u>, motto

This is parallel to Rule E25, except that E25 applies only in one-syllable words, while 025 applies to words of any length.

026 o → [o] /__-V po-et

Note the similarity to 025 where the letter is word final.

031 o → [ə] w<u>o</u>n, m<u>o</u>ther, s<u>o</u>me, l<u>o</u>ve

This occurs in stressed syllables where other pronunciations would be expected. Rule 031 generally occurs before <u>m</u>, <u>n</u>, <u>v</u>, <u>th</u>. In the Middle Ages, <u>o</u> was often substituted for <u>u</u> in the neighborhood of <u>m</u>, <u>n</u> and <u>v</u>. "The reason is that the strokes of these letters were identical, and that a multiplication of these strokes...rendered the reading extremely ambiguous and difficult..." (Jespersen, 1965, pp. 88-89).

032 o → ∅ soph<u>o</u>more, lic<u>o</u>rice

038 o → [a] /__$\{^{vV}_{x(1)V}\}$ n<u>o</u>vel, <u>o</u>xen

U

U11 u → [(y)u] /__Ce# <u>u</u>se, cr<u>u</u>de

U12 u → [(y)u] /__C$\{^{r}_{l}\}$e# b<u>u</u>gle

U13 u → [(y)u] /__CV <u>u</u>nit, cr<u>u</u>sade

U14 u → [(y)u] /__C$\{^{r}_{l}\}$V b<u>u</u>gler

U15 u → [ə] /__C(C)# gum, fuss

In the present rule set there is no Rule U21, u → [ə] /__r, to parallel the 21 rules for other vowels. All exemplars of such a rule were coded either U15 or U16, depending on environment. In future versions of the rules, a Rule U21 will be added to promote generalization across primary vowels.

U16 u → [ə] /__CC.... sudden, justice

(See Rule U15.)

U17 u → [ə] in unstressed syllables lettuce, minute

This rule was used only with words in which [ə] could not be indicated by using Rules U15 and U16, when u appeared in an unstressed syllable.

U20 u → Ø /#g__V guest, guard

This u is used to mark the correspondence g → [g] (Rule G12). A variation on this rule is gue → [g] /__#, e.g., vague.

U26 u → [(y)u] /__-V flu-id, ru-in

A similar rule, parallel to Rules E25 and O25, is u → [(y)u] /__#, e.g., flu, menu. This is rare, since final u is uncommon in English (cf. comments on Rule E18).

U31 u → [ʊ] bull, push, put

Most, but not all, exemplars of this rule can be covered by the following environment (adapted from Chomsky & Halle, 1968, p. 204):

$$u \rightarrow [ʊ] \; / \; \begin{Bmatrix} b \\ p \\ f \end{Bmatrix} \; __ \; \begin{Bmatrix} ll \\ l\# \\ sh \\ tch \end{Bmatrix}$$

e.g., full, push, butcher

Many of the exemplars in the present lexicon contain the suffix -ful (e.g., hopeful, spoonful), which may be pronounced [fəl] (Rule U17).

U32 u → Ø — natural

The only example of Rule U32 in the present lexicon is natural, which also involves palatalization (see pp. 33-35).

U38 u → [ə] /__$\{^{vV}_{x(1)V}\}$ — buxom

No occurrences of this rule were found in the present lexicon.

Y

Y11 y → [ay] /__C($\{^{r}_{l}\}$)V — rhyme, cycle, cyclone

This is the generalized "long-vowel" rule for y, combining Rules 11-14 because of low productivity. As with the other primary vowels, this rule may be divided into four rules as follows:

Y11 y → [ay] /__Ce# — rhyme, type

Y12 y → [ay] /__C$\{^{r}_{l}\}$e# — cycle

Y13 y → [ay] /__CV — tyrant, stylish

Y14 y → [ay] /__C$\{^{r}_{l}\}$V — cyclone, hydrant

Y15 y → [ɪ] /__$\{^{CC}_{C\#}\}$ — gym, pygmy

This is the generalized "short-vowel" rule for y, combining Rules 15 and 16 because of low productivity. As with the other primary vowels, this rule may be divided into two rules as follows:

Y15 y → [ɪ] /__C(C)# — gym, myth

Y16 y → [ɪ] /__CC... — pygmy, system

Y17 y → [i] /__# in unstressed syllables — baby, candy

In isolation [i] is more common, but unstressed [ɪ] (cf. general primary vowel Rule 17) is often used in connected speech. *Webster's Seventh New Collegiate Dictionary* (1967) uses [i]; *Webster's New World Dictionary* (1957) and Kenyon & Knott (1953, p. 481) use [ɪ] but acknowledge the [i] pronunciation.

Y19 y → [ay] /__'# — deny, try

This rule, as opposed to Y17, applies in stressed syllables (including one-syllable words).

SECTION III

SPELLING-TO-SOUND CORRESPONDENCES FOR SECONDARY VOWELS

The letters i and y and u and w are in complementary distribution in several secondary vowels: ai/ay; au/aw; ei/ey; eu/ew; oi/oy. In general y and w are found in word final position and i and u elsewhere (e.g., day/daily; coy/coil), although this pattern does not always hold. (Secondary vowels are generally limited in their distribution; e.g., several of them do not occur initially.)

Note that i and y are pronounced similarly when used as primary vowels: "long" i and y are [ay]; "short" i and y are [ɪ] (cf. general primary vowel Rules 11-16). i may function as a consonant, pronounced [y] (see Rule I25). In addition, u may function as consonant pronounced [w] (see Rule QU10), although w alone never functions as a vowel. However, the name of w indicates its historical relation with u.

There are a few secondary vowels which occur too rarely to be included in this report, e.g., ae, eo, eu, eau. The individual letters of these grapheme units have been coded "40" for an irregular correspondence. The following correspondences are regular and should be included with a larger lexicon:

eau → [o], e.g., beau, bureau.

eu → [(y)u], e.g., Eugene, neutral.

AI

AI10 ai → [e] stain, rain

(See Rule A22.)

ai and ay are in complementary distribution (see p. 26).

AI17 ai → [ə] in unstressed syllables captain, villain

All exemplars of this rule in the present lexicon are in the environment /__n#, which may result in a syllabic [n] (see p. 15).

AU

AU10 au → [ɔ] cause, author

au and aw are in complementary distribution (see p. 26).

AW

AW10 aw → [ɔ] saw, hawk

au and aw are in complementary distribution (see p. 26).

AY

AY10 ay → [e] day, play

In unstressed syllables, ay may be pronounced [i] or [ɪ] (cf. Rule Y17), e.g., Sunday. (Monday and Friday were spelled Mundy and Fridy in the seventeenth century; Kenyon & Knott, 1953).

ay and ai are in complementary distribution (see. p. 26).

EA

ea is sometimes a combination of e and a, e.g., create (see Rule E26). In the present classification, eal is considered one syllable pronounced [il], e.g., real, ideal.

EA11 ea → [i] each, heat

EA31 ea → [ɛ] — bread, deaf, heaven

It is very difficult to specify any environments for this rule to distinguish it from EA11. Some homographs with ea can be distinguished only by their grammatical function, e.g., lead. EA11 and EA31 sometimes alternate for present and past tenses, e.g., read/read, mean/meant (cf. sleep/slept). The following environments are found for EA31, but not EA11, in the present lexicon:

/__(C)th#, e.g., breath, health

/__sure, e.g., treasure

/__ther, e.g., feather

/__sant, e.g., pleasant

EA33 ea → [ə] /__r — earn, search

EE

EE10 ee → [i] — beet, feel

The only exceptions to this rule are been and breeches.

EI

Considering ei and ey together, the major correspondence is [e], so perhaps the numbering for EI10 and EI20 should be reversed.

EI10 ei → [i] — receive, ceiling

EI20 ei → [e] /__ {gn, n, gh} — reign, rein, neighbor

EI20 and EY10 are in complementary distribution (see p. 26).

EW

EW10 ew → [(y)u] — few, new

ew and eu are in complementary distribution (see p. 26). There were not enough exemplars of eu in the lexicon to permit its inclusion as a rule (see p. 26).

EY

EY10 ey → [e] they, obey

EY10 and EI20 are in complementary distribution (see p. 26).

The major exceptions to this rule are key and eye and compounds formed from them, e.g., keyboard, eyelash.

EY17 ey → [i] in unstressed syllables donkey, money

This may also be pronounced [ɪ] (cf. Rule Y17).

IE

ie is sometimes a combination of i and e, e.g., science, diet (see Rule I26).

IE11 ie → [ay] /__# die, lie

This rule generally applies to monosyllabic words (e.g., tie) or to compounds formed from monosyllables (e.g., untie).

IE12 ie → [i] /..._..._ field, grief

This rule applies medially (the secondary vowel ie does not occur initially).

Note that words such as applied must be analyzed as apply + ed to obtain the correct pronunciation. A similar analysis should be used with words like studied (= study + ed). (See Rules D10 and S10.)

IE17 ie → [i] /__# in unstressed syllables collie, movie

This may also be pronounced [ɪ] (cf. Rule Y17).

OA

OA10 oa → [o] load, boat

(See Rule O21.)

OE

OE10 oe → [o] /__# hoe, toe

Medial oe is a combination of o and e, e.g., poet (see Rule 026).

OI

OI10 oi → [oy] noise, join

oi and oy are in complementary distribution (see p. 26).

OO

OO11 oo → [u] broom, tool

Rule OO11 is only pronounced [u] and never [yu] (cf. p. 8).

The following environments are found for OO11, but not OO12, in the present lexicon:

/__n, e.g., moon

/__#, e.g., too

/__m, e.g., room

/__se, e.g., loose (cf. Rule S21)

/__th, e.g., booth

/__st, e.g., roost

Many words with oot and oof are unstable in their pronunciation, varying between OO11 and OO12, e.g., root, hoof.

OO12 oo → [ʊ] book, wood

(See Rule OO11.)

OU

OU10 ou → [aw] count, mountain

OU10 and OW12 are in complementary distribution (see p. 26).

OU31 ou → [ə] couple, young

Several examples of OU31 are unstressed final ous, e.g., joyous, nervous. This rule would also apply to British -our spellings for American -or, e.g., honour/honor.

OU33 ou → [(y)u] through, group

OU34 ou → [ɔ] fought, thought

All examples of this rule have the environment /__gh(t)#, e.g., cough, thought; but some exemplars of Rules OU33 and OU35 also contain this environment.

OU35 ou → [o] soul, though

(See Rule O21.)

OW

OW11 ow → [o] glow, below, own, bow

In unstressed syllables Rule OW11 may be pronounced [ə], e.g., yellow.

OW12 ow → [aw] now, allow, owl, bow

OW12 and OU10 are in complementary distribution (see p. 26).

OY

OY10 oy → [oy] boy, toy

oy and oi are in complementary distribution (see p. 26).

UE

UE10 ue → [(y)u] blue, argue

(Cf. Rules U20 and E18.)

ue is sometimes a combination of u and e, e.g., fluent (see Rule U26). In the present classification, uel is considered one syllable pronounced [(y)ul], e.g., duel, cruel.

UI

ui is sometimes a combination of u and i, e.g., fluid, ruin (see Rule U26).

UI10	ui → [(y)u]	fruit, juice
UI31	ui → [ɪ]	build, biscuit

Five of the seven examples of this rule involve build and its derivatives.

SECTION IV

SPELLING-TO-SOUND CORRESPONDENCES FOR CONSONANTS

DOUBLE CONSONANTS

Most consonants occur in doubled form (e.g., cc, ll), sometimes called geminate consonants. This is true only in the orthography. English phonology does not allow double consonants, except across word or morpheme boundaries, e.g., bookcase, unknown. (In some languages, such as Italian, double consonants are phonemically distinct from single consonants.)[8] Thus, in English, orthographic double consonants are generally leveled to their single phonological form, e.g., bb → [b]. In this paper, double consonants are described under single consonants.

> Except for the Spanish borrowing llama, [and Welsh Lloyd & Llewellyn] geminate consonants occur only in medial and final position in English spelling. The most common final clusters are ff, ll, and ss.... Rare final clusters are bb, dd, gg, nn, rr, tt and zz.... (Venezky, 1965, p. 184)

As pointed out above (Rule E18), a final e after a vowel, in what would otherwise have been a two-letter word, limits the number of two-letter words.

> Two letter words ending in a consonant were lengthened, not by adding a final e, but rather, by doubling the final consonant; thus, ebb, add, egg, inn. (Venezky, 1965, p. 75).

PALATALIZATION

According to Venezky (1965, p. 133), "The process of palatalization... accounts for many so-called irregular spelling-to-sound correspondences which involve the spellings d, s, t, x, z and the vowels which follow them in certain environments." In Berdiansky et al, (1969), palatalizations were handled by coding the syllables involved with "E" (see pp. 41-42, 48-49, 54-57, therein). A more complete rule-based treatment requires

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[8]Italian fato 'fate' and fatto 'fact' are differentiated by the medial consonant both in spelling and pronunciation: [fáto] and [fátto] respectively. In English, later and latter are differentiated in spelling by the medial consonant, but not in pronunciation; the consonant spelling indicates a difference in vowel pronunciation, [létər] and [lætər] respectively.

positing a morphophonemic level (indicated here by double slashes) between spelling and sound.

Palatalization involves the following morphophonemic-to-sound correspondences (based on Venezky, 1965, p. 134):

(a) //sy// + //$V_{unstressed}$// → [š] + [v]

(b) //zy// + //$V_{unstressed}$// → [ž][9] + [v]

(c) //ty// + //$V_{unstressed}$// → [č] + [v]

(d) //dy// + //$V_{unstressed}$// → [ǰ] + [v]

The //y// can come from two sources:

(1) The correspondence of a vowel with //yu//, e.g., Rule U11, u → [(y)u]

(2) An unstressed i becoming //y// in the environment /C__$V_{unstressed}$ (cf. Rule I25), where the other unstressed vowel is pronounced [ə].

The following examples illustrate this process:

1. Asia →

(Rules A13, S20, (2) above, A17; first syllable stressed)

//ézyə// →

(Rule (b) above)

[éžə]

2. mission →

(Rules M10, I16, SS10, (2) above, O17, N10; first syllable stressed)

//mísyən// →

---

[9]The sound [ž] does not otherwise appear in the rules of correspondence, except as noted in Rule G11. It is "the only consonant phoneme not native to English" (Kurath, 1964, p. 65) and did not exist until about 1600 when it developed through a process of palatalization similar to that described here.

(Rule (a) above)

[míšən]

3. creature →

(Rules C12, R10, EA11, T10, U11, R10, E18; first syllable stressed)

//krítyur// →

(Rule (c) above; //u// → [ə] in unstressed syllables)

[kríčər]

There is an additional spelling-to-morphophonemic correspondence which is involved in palatalization:

t → //s// /__ $VV_{unstressed}$, if the preceding consonant is not s or x (Venezky, 1965, p. 118).

Thus nation →

(Rules N10, A13, above rule, (2) above, O17, N10)

//nĕsyən// →

(Rule (a) above)

[néšən]

As can be seen, this process tends to be very complex, so it was thought easier to teach using syllables as the units of correspondence. See Chomsky & Halle (1968) for a phonological description of the palatalization process which is similar to that described above.

It should also be noted that palatalization may take place across word boundaries, e.g., can't you → //kǽnt// + //yu// → [kánču] (→[kánčə] "can't cha"). Cf. Pival and Faust, 1965.

SPECIFIC CONSONANT RULES

B

B10 b → [b] — boy, cub, number

When two different bilabial stops (i.e., b and p) are in combination (either bp or pb) the first is not pronounced, e.g., subpoena, cupboard.

b → Ø in debt, doubt, subtle. The original English spellings were dette, dout and sutle, but medieval scribes inserted the b from the original Latin sources, debitus, dubitus and subtilis. The b never was or is sounded. A b was also inserted in subject (from suget) and a spelling pronunciation developed.

B20 b → Ø /m__# — climb, comb

BB10 bb → [b] — bubble, blubber

There are no exceptions to this rule. The only word in modern English with final bb is ebb (see pp. 33).

C

C11 $c \rightarrow [s] / __ \begin{Bmatrix} e \\ i \\ y \end{Bmatrix}$ — city, lace, fancy

This is the so-called "soft" pronunciation of c, which occurs before non-low, non-back vowels. The terms "hard" and "soft" probably have no meaning for beginning readers, although the environments for Rules C11 and G11 and for Rules C12 and G12 are the same. While C12 and G12 are the voiceless and voiced velar stops [k] and [g], there is no simple phonetic relation between [s] and [ǰ] (C11 and G11). The parallel relationships between C12 and C11 and between G12 and G11 involve rather advanced phonological rules which are probably not known to beginning readers (cf. MacDonald, 1969). The velar softening rule (Chomsky & Halle, 1968, p. 219) converts [k] to [s] (C12 to C11) and [g] to [ǰ] (G12 to G11), e.g., critic, criticize; analogous, analogy. Young children would not be expected to be familiar with this phonological rule nor would they be expected to understand the relationship between the sounds (see Berko, 1965).

When sc occurs before e, i, or y, (e.g., scene, science) both s and c are realized as //s// (Rules S10 and C11); the morphophonemic //ss// is leveled to [s] (see p. 33).

C12 $c \rightarrow [k] / __ \begin{Bmatrix} a \\ o \\ u \\ C \\ \# \end{Bmatrix}$ — cat, come, cut, cream, picnic, scare

This is the so-called "hard" pronunciation of c, which occurs finally and before consonants and low and back vowels (cf. Rule C11).

CC12 $cc \rightarrow [k] / __ \begin{Bmatrix} a \\ o \\ u \\ C \end{Bmatrix}$ — yucca, account, accuse, acclaim

The environment in this rule has been expanded to include /__C, although there are no examples of this in the present lexicon. However, it is not possible to expand the environment to include /__# (cf. Rule C12), since cc never occurs finally in English; ck is used instead.

When cc appears before e, i, or y, it is a combination of Rules C12 and C11, giving the pronunciation [ks], e.g., success.

CH

CH10 ch → [č] — cheap, church

There is no double ch; in the sixteenth century, tch replaced cch (Venezky, 1965, p. 132). (Cf. Rule TCH10.)

CH31 ch → [k] — ache, school, chord, Christ

This rule always applies in the following environments:

/__r, e.g., Christ

/__l, e.g., chlorine

/#s__,e.g., school.

There are, however, other words where this correspondence is not predictable. (Many words employing Rule CH31 are borrowings from Greek.)

The other major correspondence for ch is ch → [š]; e.g., chalet, machine. These are all recent borrowings from French, where [š] is the regular correspondence for ch. (Older French loans use CH10, which was the original French correspondence, e.g., chair.)

CK

CK10 ck → [k] kick, pack

There are no exceptions to this rule.

D

D10 d → [d] dead, needle

This rule does not include past tense endings. The spelling rules for the formation of the regular past tense are as follows:

1. When the verb ends in Cy, change the y to i and add ed, e.g., studied. (Cf. played where the base ends in Vy and y is part of a secondary vowel.)

2. When the verb ends in stressed CV̆C, double the consonant and add ed, e.g., planned, occurred. (Cf. pleaded where the base ends in VVC, and murmured where the last syllable is not stressed.)

3. When the verb ends in e, add d, e.g., planed, hoed.

4. In all other cases add ed to the verb, e.g., laughed, passed.

The rules for pronunciation of the regular past tense are based on the pronunciation of the final sound of the base form:

1. When the verb ends in any voiced sound except [d] (i.e., all vowels and [b, g, v, ð, z, ž, ǰ, r, l, m, n, ŋ]), the past tense ending is pronounced [d], e.g., played [pled], planned [plænd], planed [plend].

2. When the verb ends in any voiceless sound except [t] (i.e., [p, k, f, θ, s, š, č]), the past tense ending is pronounced [t], e.g., laughed [læft], passed [pæst] (=past).

3. When the verb ends in [t] or [d], the past tense is pronounced [əd], e.g., pleaded [plídəd]; hated [hétəd].

D10 (continued)

These spelling and pronunciation rules also apply to the regular past participle, which has the same form as the past tense. Note that the correspondences for a verb in the past tense depend on recognizing the spelling and pronunciation of the base form; then the past tense pronunciation should be an automatic phonological response. Beginning readers may have some difficulty with past tense pronunciations, especially [əd] (Berko, 1958).

Some past participles, normally ending in [d] or [t] are sometimes pronounced [əd]; e.g., blessed ("Blessed are the poor in spirit..."), beloved.

Sometimes d → Ø /...n__C...; e.g., handkerchief, grandmother, pounds, stands.

(See comments on G11.)

DD10 dd → [d] hidden, sudden

There are no exceptions to this rule. The only words in modern English with final dd are add and odd (see p. 33).

F

F10 f → [f] fat, after

The only exception to this rule is of.

In some words a final [f] (f or fe) is changed to [v] (ve) in the plural (e.g., wife, wives; leaf, leaves); note also pairs such as belief, believe and safe, save.

The following alternations occur between voiceless and voiced fricatives: [f] and [v]; [θ] and [ð] (see Rules TH11 and TH12); [s] and [z] (see Rule S20). In Old English, these pairs did not contrast, but alternated according to the phonological environment. Later, the contrast became distinctive as in modern English, but some remnants of the old alternations remain. (See Jespersen, 1965, p. 199 ff.)

FF10 ff → [f] off, taffy

There are no exceptions to this rule.

G

There are two minor rules for g which have not been included because they are unproductive. They are the result of unallowed consonant clusters:

$g \rightarrow \emptyset$ /__$\{^{m}_{n}\}$#, e.g., paradigm, sign

$g \rightarrow \emptyset$ /#__n, e.g., gnaw, gnat (cf. Rule K20)

G11 $g \rightarrow [\check{j}]$ /__ $\begin{Bmatrix} e \\ i \\ y \end{Bmatrix}$ gem, age, gin, gypsy

This is the so-called "soft" pronunciation of g (cf. Rule C11).

The affricate [ǰ] can be represented [dž]. All occurrences of dg have been coded D10, G11, with the resulting pronunciation [dǰ] (=[ddž]). Since geminate consonants do not occur in English pronunciation (see p. 33, [ddž] is leveled to [dž] = [ǰ]. In the next version of the rules, a new digraph correspondence will probably be added:

dg → [ǰ], e.g., edge, ridge.

In a few words, g in the environment /__e# may be pronounced [ž], e.g., garage, rouge. Some of these words also have the pronunciation [ǰ].

G12 $g \rightarrow [g]$ /__ $\begin{Bmatrix} a \\ o \\ u \\ C \\ \# \end{Bmatrix}$ gave, go, gum, green, bag

This is the so-called "hard" pronunciation of g (cf. Rules C11 and C12).

Final g occurs only in a small number of words, mostly monosyllables.

G31 $g \rightarrow [g]$ get, girl

This rule covers the number of exceptions, often very common, to Rule G11. Because of this exception rule, the pronunciation of g in the environment /__$\{^{e}_{i}_{y}\}$ is not as predictable as for c in that environment.

GG10 $gg \rightarrow [g] / __ \left\{ \begin{matrix} a \\ o \\ u \\ C \\ \# \end{matrix} \right\}$ egg, wiggle

There are no exceptions to this rule. The only word in modern English with final gg is egg (see p. 33).

When gg is in the environment $/__ \left\{ \begin{matrix} e \\ i \\ y \end{matrix} \right\}$, the first g is pronounced [g] (G12: /__C) and the second g is pronounced [ǰ] (G11), e.g., suggest (cf. Rule CC12).

GH

GH10 gh → Ø though, taught, high

(See Rule I24)

gh → [g] /#__ and in a few other words, e.g., ghost, aghast.

gh → [f] /__# in about 10 words, e.g., laugh, cough.

[Note can be made here that G.B. Shaw's spelling ghoti to be pronounced [fɪš] is incorrect. Initial gh is always pronounced [g]; o pronounced [ɪ] is a very unusual exception occurring only in the word women; ti is only pronounced [š] when palatalized in an unstressed syllable followed by another vowel (see pp. 33-35). The spelling ghoti is pronounced--by regular spelling rules--as [goti] (see Rules GH10, O13, T10 and I26). This is discussed in Francis (1963).]

H

H10 h → [h] home, ahead

H20 h → Ø rajah, hour

This rule has four special cases:

(a) h → Ø /__#, e.g., pooh

This is the way Rule H20 has been used in coding the present lexicon. In English phonology, [h] can only be syllable initial. Kurath (1964, p. 67) states that final h is used to suggest stressed vowels. (Note: ah → [a] /__#, e.g., hurrah; cf. Rule A17.)

H20 (continued)

(b) $h \rightarrow \emptyset$ / $\acute{V}$__$V_{unstressed}$, e.g., graham

Intervocalic h is silent before an unstressed vowel, e.g., vehicle (unstressed i, $h \rightarrow \emptyset$); vehicular (stressed i, $h \rightarrow [h]$). In connected speech, this rule also applies to unstressed function words, e.g., beat him [bʹtəm] (cf. Pival & Faust, 1965, p. 863).

(c) $h \rightarrow \emptyset$ /C__, e.g., exhaust, exhibit

Note that certain combinations of a consonant plus h are consonant digraphs: ch, gh, kh, ph, rh, sh, tch, th; in these cases, the h is not silent, but part of a single grapheme unit.

(d) $h \rightarrow \emptyset$ /#__

This occurs in a small number of words and is unpredictable. The words to which it applies are heir, herb (but not Herb), honest, honor and hour; also, in some dialects, humor, humble, huge, human.

J

J10 $j \rightarrow [\check{j}]$ joy, judge

There are no exceptions in the present lexicon; in a 20,000 word lexicon (Venezky, 1965) the only exceptions are bijou, hallelujah, marijuana.

j generally occurs initially, sometimes medially, and never finally; nor can it occur doubled. dg or g is used instead of final or doubled j.

K

There are no exceptions to Rules K10 and K20.

The correspondence for the uncommon digraph kh is kh $\rightarrow$ [k], e.g., khaki.

There is no double k in English; instead, ck is used; e.g., stinker, sticker (cf. banter, batter) where the double consonant--or two consonants--indicate the use of general primary vowel Rule 16.

K10 k → [k] milk, kill

K20 k → Ø /#__n know, knot

This rule is a result of modern English phonotactics which does not allow the [kn] cluster in initial position. (Formerly, this was permitted in English and still is in German.) This is true of the following consonant clusters, where the first consonant is dropped when the cluster is in initial position: gn, mn, pn, ps, pt, e.g., gnaw, mnemonic, pneumonia, psychology, ptomaine.

L

L10 l → [l] like, mile

See general primary vowel Rule 17 for comments on syllabic [l], e.g., model [mádl].

L20 $l \rightarrow \emptyset / \begin{Bmatrix} o__k \\ a__f \\ a__k \\ a__m \\ a__v \end{Bmatrix}$ yolk, folk, half, calf, walk, stalk, palm, calm, calves, salve

(Cf. Rules A23 and O23.)

l → Ø in could, should, would.

$l \rightarrow \emptyset / o__\{^{m}_{n}\}$. There are only a few exemplars of this rule, e.g., Malcolm, Lincoln.

LL10 ll → [l] bullet, fill

There are no exceptions to this rule.

LE

LE22 le → [əl] /C__# little, stable

The actual pronunciation for this correspondence is generally [l], i.e., a syllabic [l]; cf. comments on general primary Rule 17, Shuy (1969).

M

M10 m → [m] man, came

There are no exceptions to this rule.

m → [əm] /{th, s}__#, e.g., rhythm, spasm

m → Ø /#__n, e.g., mnemonic (see Rule K20)

MM10 mm → [m] summer, mammal

There are no exceptions to this rule. There are no occurrences of final mm.

N

N10 n → [n] no, nine, fun

See general primary Rule 17 for comments on syllabic [n], e.g., sudden [sʌ́dn].

As a result of phonotactic restrictions on final consonant clusters, n → Ø /m__#, e.g., hymn, solemn.

N20

n → [ŋ] /__ x	anxious
k	thank, sink
qu	banquet
g pronounced [g]	single, fungus, finger
c pronounced [k]	Lincoln

This pronunciation of n is an automatic phonological alternation; therefore, it probably should not be explicitly taught.

Rule N20 is a phonological rule and is basically

n → [ŋ] /__{[k], [g]}

(With this statement, the n in anchor is regular because the ch is pronounced [k].) Most occurrences of this rule are before final k.

In the prefixes con-, in- and syn-, the n is rather unstable in this environment, sometimes pronounced [ŋ] and sometimes [n], e.g., conquest, income, synchronize.

NN10 nn → [n] inner, funny

There are no exceptions to this rule. The only words in modern English with final nn are inn and Ann (see p. 33).

NG

NG10 ng → [ŋ] /__# ring, song

This rule applies before most suffixes, e.g., ringing (= ring # ing) [rɪ́ŋɪŋ], singer (= sing # er) [sɪ́ŋər]. However, before the comparative and superlative suffixes -er and -est, ng becomes n + g [ŋg] (cf. Rule N20), e.g., long [lɔn], longer [lɔ́ŋgər], longest [lɔ́ŋgəst]. (The word longer, if used to mean "one who longs for something," would be pronounced [lɔ́ŋər].)

Rule NG10 is best described--theoretically and historically, although not for teaching purposes--as follows: ng → (Rules N20, G12) //ŋg// → (due to English phonotactics; cf. Rule B20) [ŋ] /__#. Cf. Jespersen (1965, p. 217), Chomsky & Halle (1968, p. 85).

P

P10 p → [p] people, pop

(See Rule B10.)

p → Ø in corps, coup, receipt.

p → Ø /#__$\{^{s}_{t}\}$p, e.g., psychology, pneumonia, ptomaine (cf. Rule K20).

PP10 pp → [p] pepper, apple

There are no exceptions to this rule. There are no occurrences of final pp.

PH

PH10 ph → [f] phone, photo

There are no exceptions to this rule.

In the word sapphire, pph apparently functions as a double ph, preventing a long pronunciation of the preceding a (cf. general primary vowel Rule 11).

QU

QU10 qu → [kw] quick, banquet

As is well known, q never occurs in English without a following u. Rule QU10 could be restated as two rules: (a) q → [k]; (b) u → [w] /q__.

QU10 (continued)

The letter u functions as a consonant when pronounced [w]. Besides Rule QU10 and in a few miscellaneous words (e.g., persuade, pueblo), the only other similar rule is u → [w] /...g__..., e.g., language, anguish. There are only eleven exemplars of this rule in a 20,000 word corpus (Venezky, 1965, p. 71).

que → [k] /__#, e.g., mosque, unique. Also in a few other words qu → [k], e.g., conquer, bouquet. Thus all occurrences of qu involve [k].

R

R10 r → [r] run, far

The correspondence for the uncommon digraph rh is rh → [r], e.g., rhyme.

Parallel to Rule LE22 there could be a rule RE22:

re → [ər] /C__#, e.g., acre, ogre.

(These are the only R40 words in the present lexicon.)

In American English the final re spelling generally occurs only after c and g to preserve the "hard" pronunciation of these letters (Rules C12 and G12). The normal er spelling would give the "soft" pronunciation (Rules C11 and G11). [The re ending is more common in British English, but it is found only in certain words (e.g., theatre has re, but danger does not); it is never never used for comparatives and agent nouns (e.g., faster, singer).] Note that when certain suffixes are added, the Cer# pattern changes to Cr...; e.g., center, central.

In some dialects (the so-called "r-less" dialects found primarily in the East and the South and in England), r is not pronounced in the environment /__$\{^{\#}_{C}\}$, or is realized as [ə] or as a lengthening of the vowel (indicated by [:]), e.g., (pronunciations based on Kenyon & Knott, 1953; see p. 8 for the pronunciation of vowels before r):

far [fa:]; farm [fa:m]; fare [feə]
her [hə]; herd [həd]; here [hiə]
sir [sə]; bird [bəd] (=bud); fire [fayə]
for [foə]; form [foəm]
fur [fə]; furl [fəl]; cure [kyuə]

R10 (continued)

In the environment /__#, r is pronounced when the next word begins with a vowel; e.g., the fur was wet [ðə fə wəz wɛt]; the fur is wet [ðə fər ɪz wɛt]. (The word here in such dialects is pronounced [hiə] and idea is pronounced [aydɪ́ə]. Since here is is pronounced [hiərɪz], by analogy idea is is sometimes pronounced [aydɪ́ərɪz] ("idear is"), resulting in an intrusive [r].) See Kenyon & Knott (1953, pp. xxxv-xxxvi) for more comments on r.

RR10 rr → [r] hurry, marriage

There are no exceptions to this rule. rr occurs finally in only four words (cf. p. 33).

S

S10 s → [s] sun, fast, horse

This rule does not include inflectional endings: plurals (e.g., boys; cf. Rule S31), possessives (e.g., boy's) and third person singular verb forms (e.g., knows).

The spelling rules for regular plurals and for third person singular, present tense verb forms are as follows:

1. If the base word ends in s, z, x, (t)ch or sh, add es, e.g., buzzes, foxes, torches.

2. If the base word ends in Cy, change the y to i and add es, e.g., studies. (Cf. plays where the base form ends in Vy and the y is part of a secondary vowel.)

3. In all other cases add s, e.g., knows, races.

(Some words ending in o add es, e.g., potatoes; some words ending in f change the f to v and add es, e.g., wives. Such words must be listed, since they cannot be predicted.)

The spelling rules for possessives are as follows:

1. For plurals ending in s, add an apostrophe, e.g., boys'.

2. For all other words (i.e., singulars and irregular plurals) add 's, e.g., boy's, mens'.

(Usage is divided on the form of possessives for singulars ending in s, e.g., either James' or James's.)

S10 (continued)

The pronunciation of regular plurals, singular possessives, and third person singular, present tense verb forms depends on the last sound of the base word:

1. When the base ends in any voiced sound except [z,ž,ǰ] (i.e., all vowels and [b,d,g,v,ð,r,l,m,n,ŋ]), the ending is pronounced [z], e.g., studies, plans.

2. When the base ends in any voiceless sound except [s,š,č] (i.e., [p,t,k,f,θ]), the ending is pronounced [s], e.g., hates, laughs.

3. When the base ends in [s,z,š,ž,č,ǰ], the ending is pronounced [əz], e.g., raises, watches.

A regular plural is pronounced the same in the possessive, e.g., boys' [boyz] (=boys). Irregular plurals follow the rules given above, e.g., men's [mɛnz]. Usage is divided on singular possessives whose bases end in [s] or [z], e.g., James'/James's can be pronounced either [ǰemz] or [ǰémzəz].

Note that these correspondences depend on recognizing the spelling and pronunciation of the base form; then the inflected pronunciation should be an automatic phonological response. Beginning readers may have some difficulty with these pronunciations, especially [əz] (Berko, 1958).

"The correspondences for initial and final s are fairly regular; those for medial s... are highly irregular and cannot be predicted with any high degree of certainty" (Venezky, 1965).

s → Ø in some words, e.g., corps, island. The s in isle, island and aisle "has always been purely graphic" and never pronounced (Kurath, 1964, p. 60); cf. Old English iland 'island', French île.

S20 s → [z] /V__V nose, easy

In the nouns house and use and the adjective close, s → [s]; when these words are used as verbs, s → [z]. (Cf. glass/glaze, grass/graze. See Rule F10.)

S21 $s \rightarrow [s] / \begin{Bmatrix} ou \\ oo \\ ea \\ a \end{Bmatrix} __e\#$ house, moose, lease, case

This rule has several exceptions to which Rule S20 applies, e.g., house (verb), ease, phrase.

S31 $s \rightarrow [z] / __\#$ trousers, wives, riches

This rule covers plural forms whether or not there is a singular (cf. Rule E19). It also covers words which are not plurals, but which have related forms without the final s (e.g., news, hers). Rule S31 has been used for coding purposes; in teaching, this should be considered a regular automatic phonological alternation (cf. Rule S10).

SS10 $ss \rightarrow [s]$ mess, missile

After ll, ss is the second most frequent double consonant in the present lexicon. A large number of its occurrences are in the suffixes -less and -ness.

SH

SH10 $sh \rightarrow [š]$ shoe, rush

There are no exceptions to this rule.

T

T10 $t \rightarrow [t]$ title, let

In certain medial positions, especially the environment /V́__V unstressed, t and tt may be pronounced as a voiced flap, similar to [d], but distinct from it in most dialects; see Francis (1958, p. 89); Kurath (1964, p. 41); Kenyon (1964, pp. 126-127).

T20 $t \rightarrow \emptyset / \begin{Bmatrix} s__le\# \\ s__en\# \\ f__V \end{Bmatrix}$ wrestle, fasten, often

In addition, t → Ø irregularly in a few other words, e.g., Christmas, depot.

et → [e] /....C __′# (i.e., when stressed as the last syllable) in certain words of French origin, e.g., buffet, ballet (cf. regret and other words to which this rule is not applicable).

TT10 tt → [t] — li<u>tt</u>le, mi<u>tt</u>

There are no exceptions to this rule. Final <u>tt</u> occurs in only four words (cf. pp. 33-34).

TCH

TCH10 tch → [č] — ma<u>tch</u>, no<u>tch</u>

(See Rule CH10.)

There are no exceptions to this rule.

Like <u>dg</u> (cf. Rule G11), <u>tch</u> could be considered a combination of <u>t</u> and <u>ch</u>. [č] can also be represented as [tš]. Thus <u>t</u> + <u>ch</u> (T10 + CH10) → [ttš] → (leveling of geminate consonants; see p. 41) [tš] → [č].

TH

There is no double <u>th</u> (except possible in <u>Matthew</u> where <u>tth</u> prevents a long pronunciation of the preceding <u>a</u>; cf. general primary vowel Rule 11).

TH11 th → [θ] — <u>th</u>in, ba<u>th</u>

Final [θ] often changes to [ð] in the plural (with no change in spelling), e.g., <u>baths</u>, <u>paths</u> (see Rule F10).

TH12 th → [ð] / __ $\begin{Bmatrix} e \\ er \\ ern \end{Bmatrix}$ # — ba<u>th</u>e, fa<u>th</u>er, nor<u>th</u>ern

Words with final <u>the</u> are generally verbs derived from nouns without the <u>e</u>. The nouns have a "short" or other non-"long" vowel and [θ], while the verbs have a "long" vowel and [ð] (cf. general primary vowel Rule 11), e.g.,

<u>bath</u> -- <u>bathe</u>
<u>cloth</u> -- <u>clothe</u>
<u>breath</u> -- <u>breathe</u>

(See Rule F10.)

TH13 th → [ð] in pronouns, conjunctions, and other function words — <u>th</u>ey, al<u>th</u>ough, <u>th</u>e

TH13 (continued)

[In the Middle Ages the runic symbol Þ was used for [θ] and [ð]; e.g., Þ e = the. In the early days of printing, it was replaced by the closest symbol from the Roman alphabet, y, e.g., Þ e → ye (=the), which was always pronounced with a [ð] and never with a [y]. Soon after the advent of printing, th became established for [θ] and [ð].]

V

V10 v → [v] vase, love

(See Rule F10.)

There are no exceptions to this rule.

v does not occur finally, except in the nickname Bev and in some slang expressions, such as rev up (an engine). When the sound [v] occurs finally in a word, the spelling adds e, e.g., have (cf. Rule E18).

Double v is rare in English (cf. general primary vowel Rule 38).

W

w is sometimes the second part of a secondary vowel combination (e.g., ew). When there is the possibility of confusion (i.e., when there is a vowel on each side of the w), syllable division has been indicated in the present lexicon, e.g., sew-er, be-ware.

W10 w → [w] wet, beware

W20 w → ∅ /#__r wren, wrong

w → ∅ in answer, sword, two, and (in some dialects) toward(s); these are the only exceptions to Rules W10 and W20.

WH

WH10 wh → [hw] or [w] (depending on dialect) when, whether

The [hw] pronunciation was spelled hw until the thirteenth century, when the modern reversed digraph was introduced (e.g., Old English hwat 'what').

WH10 (continued)

wh → [h] in who, whom, whose, whole, and in some pronunciations of whoop, whopee.

X

X10 x → [ks] box, oxen

x → [gz] /V__(h)V́ (i.e., when the following vowel is stressed), e.g., exact, exist, exhaust. Note exhibit ([gz]), exhibition ([ks]); cf. comments on Rule F10.

Although there are no examples in the present vocabulary, x → [z] /#__, e.g., xerox, xylophone.

Y

y is sometimes the second part of a secondary vowel combination (e.g., oy). When there is the possibility of confusion (when there is a vowel on each side of the y), syllable division has been indicated in the present lexicon, e.g., play-er, be-yond. y is also a primary vowel.

Y10 y → [y] yet, beyond

There are no exceptions to this rule when y is consonantal.

Z

Z10 z → [z] zoo, lazy

The only exception in the present vocabulary is waltz; this is a result of English phonology: [s], not [z], occurs in the environment /[t]__#, e.g., cats (cf. Rule S10).

"Z is the least frequently used letter in Modern English orthography..." (Venezky, 1965).

ZZ10 zz → [z] buzz, fuzzy

Conclusion

This paper has discussed in detail the spelling-to-sound correspondence rules used as a basis for SWRL's Communication Skills Program. While some suggestions for teaching have been made, there remains the major task of translating these correspondence rules into an instructional program. A prerequisite to this translation process will be the sequencing of the rules and the lexicon to provide a design for reading instruction.

Preliminary steps in sequencing the correspondence rules were taken by Desberg and Cronnell (1969) and some results of that work are reflected in the present paper. However, Desberg and Cronnell sequenced the rules by grapheme-unit class, i.e., by primary vowels, by secondary vowels, and by consonants. Work is currently underway to combine these classes to form a complete sequence of rules; this sequencing should provide additional information on the nature of the rules and on relationships between rules. In addition, when the words in the lexicon are arranged according to the sequenced rules, a more detailed study of rule-word interactions should be possible, providing useful information about the applicability of correspondence rules in beginning reading instruction. Such work will add to the body of knowledge about spelling-to-sound correspondences.

Moreover, the design for an instructional program will include the complete 9000-word Berdiansky et al. (1969) lexicon. In order to do this, new correspondence rules will have to be formulated to account for words of more than two syllables and to provide for additional exemplars of previously low-frequency rules. Thus, additions and revisions suggested in this paper will be included when a complete reading program is designed.

Finally, while spelling-to-sound correspondences provide the base for reading, their converse, sound-to-spelling correspondences, provide the base for spelling. Although spelling-to-sound correspondences cannot be simply reversed to sound-to-spelling correspondences, there is clearly a close relationship, one which can be usefully exploited in the spelling component of a unified communication skills program. Research in this area will provide even greater knowledge of the relations between speech and orthography in English.

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